

Drone Warfare – A history

Conflicts in Ukraine and Iran have brought the military use of Drones into everyday language. By military Drones, I mean unmanned machines or vehicles which are able to operate by remote control or even autonomously. Mostly, it's the aerial sort we hear about, though a drone could function on land, sea or in the air.

Drones are usually associated with an explosive device sent out to destroy something, but can of course be used for a range of military purposes, for example reconnaissance.

Although it's the Ukraine and Iran conflicts which have got us all talking about drones, in this talk I will be exploring their history.

I don't know if you've thought about when military drones first appeared, but I've traced them back to the Nineteenth Century.

Perhaps what might be seen as the first drone came along with the development of what we now see as the modern torpedo.

About the middle of the Nineteenth Century, an officer in the Austro-Hungarian navy, Giovanni Luppis, came up with the idea of an unmanned explosive boat which would be steered from the shore towards its target. Actually, he got the idea from the papers of a then deceased artillery officer. Anyway his explosive boat never really worked, often being defeated by the state of the sea or the difficulty in managing the steering ropes it used. However, in 1864 Luppis showed it to Robert Whitehead, ... and Whitehead went on to develop what we now see as the torpedo.

Whitehead's torpedo idea was a self-propelled, underwater weapon, just aimed and fired at a target. Others about that time also had a go at developing a torpedo, but some went for weapons that could be steered after they were launched/fired. Some were patented and actually employed in various situations.

In 1872, John Louis Lay, an American inventor came up with the Lay Dirigible:

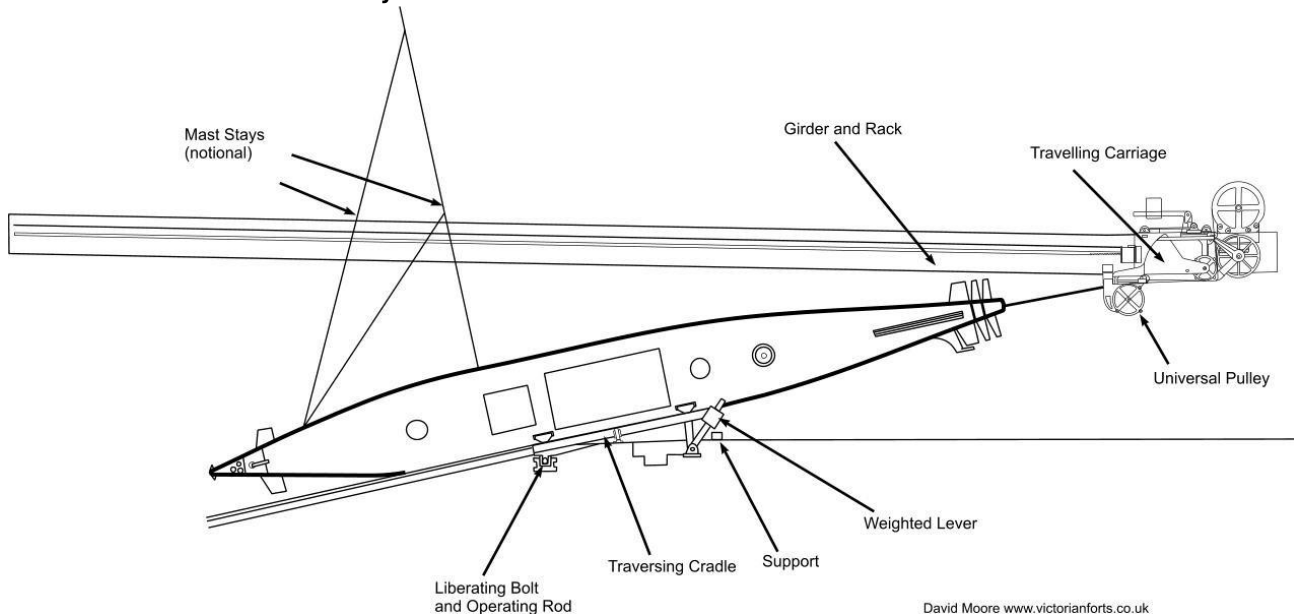


This was a surface-running cylindrical vessel with conical ends, powered by a reciprocating engine fuelled by compressed carbon dioxide gas. Two cables were paid out from the torpedo to the controlling ship or shore station which allowed the operator to steer it by means of electrical signals.^{[1][3]} It had a length of 7.6 m and a diameter of 600 mm and with an effective range of 1.25 miles, speed of 6 knots, 100-pound dynamite load and 2,800-pound total weight. The Lay torpedo was adopted by the U.S. Navy. (The USN was reluctant to purchase and use Whitehead torpedoes in 1872.)

There were other such, steerable, torpedoes developed around that 1870-1890 period.

One of the most promising was the Brennan torpedo:

DRONE WARFARE A History



Brennan torpedo

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The Brennan torpedo was a torpedo patented by Australian inventor Louis Brennan in 1877. It was a weapon for shore defence. It was propelled by two contra-rotating propellers that were spun by rapidly pulling out wires from drums wound inside the torpedo. Differential speed on the wires connected to the shore station allowed the torpedo to be guided to its target, up to 2,000 yards (1,800 m) away, at speeds of up to 27 knots (31 mph).

The Brennan torpedo became a standard harbour defence in parts of the British Empire and was in use for more than 15 years. Operational stations were established in the UK on the Thames, on the Isle of Wight, Cork Harbour, Hong Kong and at Malta.

The Brennan torpedo has been described as the world's first *practical* guided missile.

So, over 150 years ago, we have the first examples of what we now label as military drones.

Towards the end of the nineteenth century, there was also some development of controlling the movement of machines by radio-control.

A certain gentleman called Tesla demonstrated a small radio-controlled boat in 1898. Thinking he might be able to sell the idea to the US as a radio-controlled torpedo, Tesla's 1898 patent included a clockwork frequency changer so an enemy

could not take control of the device. Despite its possibilities, it was not adopted by the US.

Anyway, Tesla's torpedo could be seen as the first true radio-controlled drone.

So, by the beginning of the Twentieth Century, the potential for unmanned and steerable drones in warfare was clearly evident.

The First World War produced several drones.

This is a few of those I've found:

Soon after the war began, the British started work on developing a radio-controlled, pilotless aircraft, which, armed with explosives, could be used to destroy German zeppelins by flying into them.

DRONE WARFARE A History



'Aerial Target'

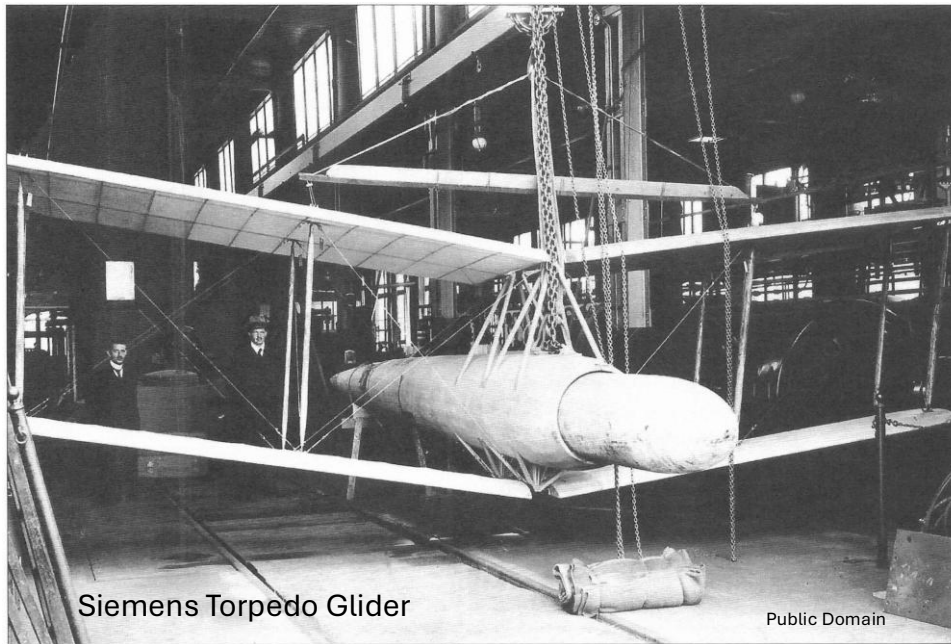
Great War Aviation Society

4

It was called 'Aerial Target' (that was for secrecy reasons, hoping it would be thought as being something to test anti-aircraft measures). By 1917 six had been produced. They were to be launched from rails on the ground, but some were lost during trials and none were used operationally in the war.

The Germans also tried their hand at aerial drones.

In October 1914, a Dr Wilhelm von Siemens proposed what became known as the Siemens torpedo glider.



5

This was a wire-guided flying missile that would have comprised a naval torpedo with an attached airframe. It was not intended that it be flown into a target; rather, at a suitable altitude and position, a signal would have been transmitted which would cause the airframe components to detach from the torpedo which would then enter the water and continue towards its target. Guidance signals were to be transmitted through a thin copper wire unrolled from a 2.5 mi (4.0 km) reel above the fuselage, and guide flares were to be carried to help with control.

Flight testing was performed from January 1915 onwards, using airships as carriers. Different types of biplane and monoplane airframes were tested, to which a torpedo was fitted, before a biplane layout was adopted due to its greater carrying ability.

The last test flight was performed on August 2, 1918. On this flight a 1,000 kilogram (2,200 lb) biplane glider was launched from a zeppelin. The glider was released from 1,500 metres (4,900 ft) over Germany and worked as expected until its control wire that attached the glider to the Zeppelin snapped and the glider spun out of control.

It was planned to use the Siemens-Schuckert R.VIII bomber – a 6-engined, 157ft wingspan aircraft – then the world's largest aircraft - as the carrier craft for the torpedo-glider, but the Armistice put a stop to the project.

I'll just add that during the WWI period, the United States had several attempts at producing a plane that could take off and fly a pre-determined route and drop

bombs or dive into a target at a certain point. These were quite sophisticated in their ability to fly a pre-determined course but are not really drones in our context of being steerable in flight and were more like a V1.

In WWI there were various attempts at producing what we'd call land drones. They all tended to be called 'Land Torpedoes', and were tracked land vehicles, carrying explosives, which could be steered to a target by someone away to the rear who could drive it through connecting wires.

I saw the French designed two, the Americans one and the British also had designs for one.

Only one, the French 'Crocodile', got into production, but I reckon it never saw action.

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French 'Crocodile' Land Torpedo

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6

The "Crocodile" land torpedo was an electric-drive, self-propelled remote-controlled land torpedo. It was intended to crawl across no man's land and blow-up enemy trenches or fortifications. I did see comment that it saw combat in 1916, but could not locate any specifics, so I suspect it was never actually sent into action. Some YouTube footage I saw showed it moving very slow, perhaps 1 or 2mph, across various terrain.

Interwar years:

In the 1930s, a new type of drone appeared in the skies. This was a radio-controlled pilotless aircraft, designed to help improve anti-aircraft measures by being a target for AA gunners.

The British had two: the Queen based on the Fairy III F biplane and the Tiger Moth Queen Bee, another biplane. There were only three Fairy Queens, but 470 Queen Bees.

I don't have a picture of the Fairy aircraft, or a free copy of the Queen Bee:

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7

This is a Tiger Moth DH82 model, the same as the Queen Bee. This one has a pilot. The remote-controlled version has a smooth fuselage extending over the seat.

The De Havilland Queen Bee was a pilotless, radio-controlled version of the Tiger Moth trainer used for target practice. It could use either wheels or floats, often being launched from catapults in order to take off.

These target trainers were flown by radio-control, but I suspect they flew fairly sedately and at a maximum of 100mph were probably not like an attacking aircraft would, so I suspect the training they provided to AA gunners may have given them a false sense of security, but was better than nothing.

This is the US **Radioplane OQ-2**

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OQ-2A Radioplane

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8

It was the first mass-produced unmanned aerial vehicle or drone in the United States. The OQ-3, became the most widely used target drone in US service, with over 9,400 being built during World War II.

I'm sure AA gunners gained a lot of experience shooting at an actual plane, though, like the British planes, shooting at a plane with a maximum speed of 85mph may not have been like the real thing.

However, one person who did benefit a lot from the American drone was this young lady:

DRONE WARFARE
A History



9

If you don't recognise her, this is Norma Jean – the future Marilyn Monroe.

It was at the factory where they built the target drone that an Army photographer, shot pictures of a young woman assembler named Norma Jeane Dougherty. This led to photos of her modelling and then screen testing to be a film actress.

In the 1930s, the Soviets developed a radio-controlled tank – the Teletank

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A History



Soviet TT26 'Teletank'

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10

These images are of a destroyed T26 teletank. I could not get a good free image of a teletank.

The Teletank was a radio-controlled tank. It was operated as a two-tank set up, with the radio-controlled tank out ahead, being controlled from another tank up to a mile behind. The teletank was armed with machine guns or flamethrower or smoke canisters or sometimes an explosive bomb. Standard tactics were for the control tank (with radio transmitter and operator) to stay back as far as practicable while the teletank (TT) approached the enemy. The control tank would provide fire support as well as protection for the radio control operator. If the enemy was successful at seizing the teletank, the control tank crew was instructed to destroy it with its main gun. Various soviet light tanks were configured as teletanks.

The Teletanks were used in the Winter War between the Soviets and the Finns in 1939-40 and may have been successful in places during that conflict. Some may have been used at the beginning of the German invasion in 1941. However, the tanks used were largely obsolete and would seem to have been easily destroyed by German AT guns.

During WWII, the Germans used three remote-control land vehicles as demolition vehicles.

The Goliath:

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Goliath

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This was a 1.5m long, tracked demolition vehicle, either electric or petrol driven, and controlled through a long cable. At under 4mph, they were not fast. They could operate up to a mile away, depending on terrain. They carried 60 or 100 kg (130 or 220 lb) of high explosives, depending on the model, and were intended to be used for multiple purposes, such as destroying tanks, disrupting dense infantry formations, and the demolition of buildings or bridges. Goliaths were single-use vehicles that were destroyed by the detonation of their warhead.

The Goliath came about after the Germans captured a French prototype for such a vehicle.

Over 7,500 Goliaths were produced. Starting in 1942, they were used on various fronts. They were used in Italy at Anzio, and against the Polish resistance during the Warsaw Uprising. A few Goliaths were also seen on the beaches of Normandy during D-Day, though most were rendered inoperative after artillery blasts severed their command cables.

Goliaths mostly failed to reach their targets, although the effect was considerable when they did.

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Springer

This is the Springer Medium Demolition petrol-driven vehicle. A driver, sitting in the back of the Springer, drove the vehicle close to the target before dismounting. The final approach and the detonation of the 330 kg (730 lb) high explosive charge was controlled by a wired or wireless remote-control device. About 50 were built between late 1944 and the end of the war. In the radio-control version, they could

travel about 2km. The Springer showed the same problems as other remote-controlled demolition vehicles: They were expensive and not very reliable. As the explosive charge was an integral part of the vehicle, it could only be used once.

DRONE WARFARE A History



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13

This is the German's third remote-control demolition vehicle, the 3½ ton, Borgward IV. This was the largest of the three vehicles and the only one capable of releasing its explosives before detonation, so, unlike the others, it could be reused.

It was based on a panzer 1 tank; it was radio-controlled and capable of 25mph. It carried a 1,000lb timed charge. It had a petrol-engine and was capable of travelling 75miles – though that was not under radio-control. A man inside the Borgward would drive it close to the target, then dismount and control it from another tank fitted with the necessary radio-equipment.

When it reached the target, the vehicle was meant to drop the charge and leave the blast zone. While the Borgward IV was armoured, this was relatively thin; it was enough to protect it from small arms and shrapnel but inadequate against anti-tank guns. Its bigger size also meant it was much easier to spot and target than the other demolition vehicles. Just as with the smaller remote-controlled vehicles, the remote driver had to keep sight of both the target and the Borgward in order to be able to complete his mission.

It was first produced in 1942 and went on till 1944. By then almost 1200 had been produced.

Like Germany's other remote-controlled demolition vehicles, the Borgward IV was not considered a success; it was unreliable and expensive, although unlike the Goliath and Springer, it could be re-used multiple times if all went to plan.

So, while these demolition vehicles were true drones, if they were not considered a success, one wonders why the Germans continued to build them. If anything, they must have diverted resources from other vehicle production.

During the war, there were various other drones.

There were acoustic homing torpedoes. The first passive acoustic torpedoes were developed nearly simultaneously by the United States and German Navies during World War II.

DRONE WARFARE A History



Zaunkönig Torpedo

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14

Germany was developing electrically-driven acoustic torpedoes by 1933. During the war, they developed the G7e/**T4** Falke torpedo, which was first deployed by a few U-Boats in March 1943, but they were quickly phased out of service in favour of their successor, the **T5** Zaunkönig torpedo in August 1943. The T5, nicknamed GNAT by the Allies, first saw widespread use in September 1943 against North Atlantic escort vessels and merchant ships in convoys.

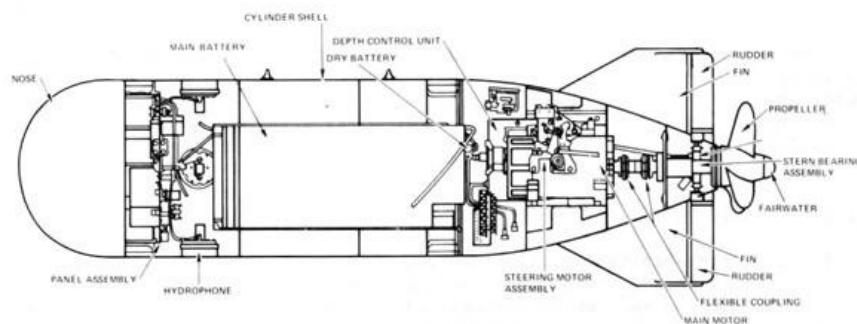
The GNAT was capable of travelling at 24 knots (44 km/h) and had an effective range of about 5,000 metres against convoy escort vessels proceeding at speeds between 10 (18 km/h) and 18 knots (33 km/h). The homing system consisted of hydrophone receivers and altered the direction of the rudder via an

electropneumatic device. The acoustic homing torpedo was specifically designed to be attracted by the pitch of an escort's propellers and — even if aimed inaccurately — to explode under the ship's stern.

In spite of highly effective Allied countermeasures, a total of about 650 GNATs were fired in combat, sinking 77 ships.

USN studies for their acoustic torpedo – code-named FIDO - began in late 1941. with production models getting to the navy in March 1943.

DRONE WARFARE A History



USN Mine Mark 24 'Fido'

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15

The Mark 24 mine was an air-dropped anti-submarine (ASW) passive-acoustic torpedo; it was called a mine to conceal what it was. An anti-ship torpedo, the Mark 28, was introduced in 1944.

The Mk24 was much smaller than a conventional torpedo, being only 2m long. Once in the water, FIDO performed a circular search at a predetermined depth. Initially the torpedoes were set to search for targets at depths of 50 feet (15 m), this was later changed to 150 feet (45 m).

FIDO's relatively low speed of 12 knots could outrun submerged, but not surfaced, U-boats.

During the war, 204 FIDOs were dropped by a whole range of US and British planes*, sinking 37 and damaging 18 German and Japanese submarines. They were about twice as effective as air-dropped depth-charges. *incl PBY Catalina (USN)

— the most common FIDO platform; Liberator (USN); Avenger; and sometimes the B25 Mitchell; Sunderland, Wellington; Halifax; Swordfish.

During WWII various aerial drones were deployed. The most famous were German:

DRONE WARFARE A History



Fritz-X

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16

This is the 3,500lb Fritz-X guided bomb. It was a guided anti-ship glide bomb. The *Fritz X* was one of the first precision guided weapons deployed in combat.

The Luftwaffe identified the problem of hitting moving ships in the Spanish civil war and there had been experiments with various free-falling remote-control bombs before the war.

The Fritz was taken aloft by a plane - usually a Dornier 217 - and released from a height of some 4,000 or more metres and at least 5km from its target. An operator in the plane then guided the diving bomb by radio-control onto its target. Fritz was an armour-piercing weapon capable of penetrating armour 5in thick, so able to take on cruisers and battleships. Its armour piercing ability, plus its 710lb warhead would make it a dangerous weapon.

It first saw action in 1943. Arguably its greatest success was when it was used against the Italian fleet after the Italian surrender. 14 Italian warships, including three battleships, were on their way to Tunisia to surrender to the Allies. They were attacked by Fritz-armed Dorniers. One battleship was damaged by one Fritz hit and

another – the flagship *Roma*, a modern, 40,000-ton battleship - was hit by two. The *Roma*'s magazine exploded and the ship blew apart and sank with great loss of life. Other Fritz successes included seriously-damaging hits on the British battleship *Warspite* and the US cruiser *Savannah*.

Another German radio-controlled air-launched missile was the Henschel Hs 293

DRONE WARFARE A History



Henschel Hs 293

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17

The Hs 293 was, like the Fritz-X, an air-launched radio-guided glide-bomb. It was the first operational anti-shipping missile, first used in August 1943 and then with increasing success over the next year, damaging or sinking at least 25 ships. Unlike the Fritz, it was used against unarmoured targets, though still had a large (650lb) warhead.

Also unlike the Fritz-X, the Hs293 had a liquid-fuel rocket engine to give it extra range and allow it to be launched from a lower altitude. The rocket only burned for 10 seconds, after which it would glide to its target.

Towards the end of the war, the Germans used a two-plane system to try and attack specific target. These were one plane, usually a fighter, fastened atop an explosive-laden bomber. The two were then flown to a point where the fighter pilot aimed the bomber at the target, then detached the bomber to fly on by itself. This is not a drone by my definition as the bomber was not controlled after release.

The Americans did come up with a similar system – Operation Aphrodite - where an old bomber, packed with explosives, was directed at a target, but the bomber was radio-controlled from an escorting plane. The bombers were piloted to a point where the 2-man crew bailed out and the direction of the plane was taken over by the escorting plane. These were aerial drones by my definition. 15 Aphrodite missions were flown, but none was successful.

Interestingly, one of the pilots who flew one of the explosive-laden bombers was Joseph Patrick Kennedy Jr.; he was John F Kennedy's oldest brother. His bomber unfortunately blew up well before he and his crewmate were due to bail out.

So, by the end of WW2, there had been various drones used in action, some successful, some not, but they and their predecessors set the stage for the future use of drones – the things we see today.